

## The Ware Collection of Blaschka glass models of flowers at Harvard.

WALTER DEANE.

In the botanical museum of Harvard University is to be seen a collection which is absolutely unique in every way. It is the Blaschka Glass Flower Collection, presented by Mrs. Elizabeth C. Ware and Miss Mary L. Ware, in memory of Dr. Chas. E. Ware, of the class of 1834. These flowers are intended to illustrate the typical forms of phenogamic vegetation in America, and certain forms of the cryptogams will also be represented. The work is being done by the artists, Leopold and Rudolph Blaschka, father and son, living in Hosterwitz, Germany. It was through the untiring energy of Dr. Geo. L. Goodale that these artists were induced to abandon their work of making glass models of animals, chiefly marine invertebrates, which were sold to museums over the world, and devote themselves entirely to the construction of plants. They were, however, finally persuaded, on their own terms, to give their entire time to this work, and, by the last contract executed in Dresden in 1890, a certain number of models are to be sent to this country twice a year, for ten years. An American garden around their house supplies them with North American plants, while, from the royal garden of Pillnitz near by, they secure specimens of the vegetation of Central and South America. Leopold, the son, visited this country in 1892, and, in his travels to Jamaica and over our West, he prepared himself, by studies in color and collection of material, for the production of over 200 species.

Certain secrets are in their possession, such as the use of color, the preparation of the more fusible kinds of glass, and a peculiar method of annealing. The process is not, in any sense of the term, glass-blowing. Dr. Goodale, who alone has been permitted to see the artists at work in their studio, was astonished at the rapidity and deftness with which they accomplished their wonderful results. They each average 50 plants a year, and, when the amount of labor, and the fineness of detail are considered, this is truly marvellous. Already 450 large and 1800 small models are on exhibition here, dis-



played in plate-glass cases in well-lighted rooms. What I wish to call especial attention to in this paper is, not the economic or aesthetic side of these models, but their botanical accuracy.<sup>1</sup>

Has the general public, has even the scientific student any idea that the glass flowers in the Blaschka collection possess an accuracy of detail that is positively startling? The eye is at first attracted by the great beauty of the flowers, as they lie on their white cards in the glass cases, and, on a closer examination, we are more and more surprised and delighted to find nature so accurately followed in all those details that can be seen by the unaided eye. But surely the lens must reveal inaccuracies which are otherwise invisible. It seemed to me impossible that the artists could have produced a plant covered, perhaps, with minute flowers, with such exactness that any flower taken at random should follow the specific characters of that particular species, as if we had the natural plant before us. The general end would be subserved if the aesthetic features were kept in view, and a reasonable care in the finer points were shown. Even then the work of the artists could not be too highly commended. But, surely, nobody could expect to find the right number of stamens in every flower, the proper degree of pubescence on the stem, and such other characters as only a microscopic examination would reveal. It was to test this question of botanical accuracy in those finer details that I made a critical study of a number of specimens taken at random from various orders. I compared each plant with my own herbarium specimens, relying more on the natural plant than on the printed characters. In this way I could see many fine points which are not described in the books.

The first specimen was *Aster Novæ-Angliæ* L., var. *roseus* DC. The upper half of the plant is represented, besides four magnified portions of the flower-head. The hirsute stem and the numerous auriculate finely pubescent leaves are perfectly represented, but, when one examines the inflorescence, the wonder deepens. As far as the delicate fingers of the artists, guided by a most accurate knowledge of the complex structure of this flower-head could accomplish it, everything is present. The linear recurved scales of the involucre, the

<sup>1</sup>For further information on the inception of this collection, see the article on the Blaschka Glass Flower Collection in the Harvard Graduates' Magazine for July, 1893.



roseate rays showing even the styles (for in *Aster* the ray-flowers are fertile), the discoid or central flowers, are all clearly depicted. This is true not merely in a single head, but in them all, without exception. The young buds, showing only the involucral scales, are very natural, while in the older buds the rays are erect, not having fully expanded, and all the discoid flowers show only their small rounded tops. In the fully developed heads the central flowers have opened, and the syngenesious stamens show their yellow anthers in the outer row or rows, as one head is older than another. Herein the artists have shown their wonderful skill. Their models are the living plants, and every flower has its separate pattern, no two being exactly alike. They are not all cast in one mould.

In the older heads the central flowers have all opened, the stamens cover the surface, and the rays are incurved with withering tips. In this species, as well as in all the others, the magnified portions have been done with the greatest accuracy, and afford a fine object lesson. An involucral scale shows the glandular pubescence, and a floret, enlarged thirty times shows the hairy akene with the pappus of capillary bristles upwardly barbed, while the tips of the five-lobed corolla have their peculiar rosy hue, so different from that of the rest of the floret. The stamens pointed at the top and the forked style are all there too. The systematic analysis of this *Aster* can easily be made from the model, so perfect is its construction.

I have thought it best to give these details in the case of one plant, so difficult to produce, but, in the case of the others, which were as carefully studied, to give the important features of only a few. I found the same fidelity in matters of the slightest detail. Sixteen species I examined by careful comparison, besides making a more general observation of a large number. I sought faithfully to find some error, something systematically wrong. A fair criticism should disclose whatever faults may exist, but I failed to find such faults, with the exception of a very few cases, where some feature was not quite like that of the type species. The artists drew largely for their material from cultivated specimens of our plants, and in the few cases where some slight detail is not quite typical of the species, I am confident that this is owing to the fact that variation is apt to occur in plants under culti-



vation. There is such rigid observance of the very minutest features in every other case that we can be absolutely sure that every model is an exact copy of the fresh specimen which the artists had in hand.

*Steironema ciliatum* L. exhibited most beautifully all the fine characteristics of that gamopetalous species. The cuspidate-pointed, erose-denticulate corolla lobes, with stamens opposite these lobes, give the flowers a most natural appearance. Here, too, the varying age of the flowers is shown, from the tightly-closed bud to developing fruit. The ciliate petioles, a character to which the plant owes its specific name, are faithfully produced. The magnified stamen shows the fine granules on the filament, as they occur in the living plant.

In the case of *Aralia spinosa* L., the building up of the complex inflorescence with its multitudinous minute flowers, is almost past belief. In this cluster, with its flowers so small that their structure can be seen only with a lens, while many of its buds are so minute as to be indistinguishable to the naked eye, I counted, of buds, blossoms and developing fruit, from 2,500 to 3,000. And yet every flower has its five petals, and five alternating stamens with long filaments. I sought to find on the under part of the cluster some flowers perhaps less carefully done, as being practically out of sight, but they were all equal in their perfection. The immense compound leaf shows the spines scattered irregularly along the stalk and midribs. The pale under surface of the leaflets is quite invisible owing to the position of the leaf on the card. Were every specimen in the collection to be inverted, the same accurate work would be seen.

It is needless to multiply cases. It would be a continued record of what has already been described. Such wonderful work as this could have been done only by those whose love for nature and nature's works was deep. This love, combined with a master's skill, has produced a result never before equalled. How can we sufficiently admire the conscience that will not allow the slightest detail to be overlooked where this omission might most naturally be expected, and the patience that makes the last flower as accurate as the first, though there be hundreds on a single plant.

Each flower of our common milkweed, *Asclepias Cornuti* Decsne., shows the interesting features of this genus. I counted forty-four flowers, and thirty buds, and in each case there



were the five hoods with their incurved horns surrounding the stigma. No two leaves were alike, but they exhibited the variation observable in this species.

The delicate corollas of *Teucrium Canadense* L., the wood sage, show their four exserted stamens. The blue flowers of *Polemonium cæruleum* L. are rendered wonderfully perfect by the five stamens, with hairy base, and fine 3-lobed style, while *Euphorbia corollata* L., in its singular involucre, contains the sterile flowers, each consisting of but a single stamen, and, in many cases, the fertile flower protrudes with its 3-forked style, each fork showing under the lens that it is cleft at the end. Here again the natural character is shown in the fact that the fertile flower is in various degrees of development; in some cases not yet visible, and in others with its ovary drooping over the side of the involucre. The lens is necessary to detect all this. I would call special attention to the inflorescence of *Alisma Plantago* L., which is wonderfully accurate, and also to *Hordeum jubatum* L., a most successful attempt to copy the long-awned spike of this grass. The magnified portions show the structure of the flowers.

But enough has been said to show the marvellous care and accuracy of the artists in all their work. Every plant tells the same story of nature closely followed out, and I am glad to bear my testimony to the almost magical work of Leopold and Rudolph Blaschka.

Cambridge, Mass.